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For: SENSOR READOUT CIRCUIT

1 1. A sensor readout circuit which provides a frequency signal output, the  
2 readout circuit comprising:  
3 a phase detector circuit responsive to an output signal from a sensor and  
4 an input signal to the sensor and configured to detect the phase difference between the  
5 input signal and the output signal; and  
6 a drive circuit responsive to the phase detector circuit and configured to  
7 maintain a fixed phase difference between the input signal and the output signal.

1 2. The sensor readout circuit of claim 1 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at zero degrees by the drive  
3 circuit.

1 3. The sensor readout circuit of claim 1 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at 90° by the drive circuit.

1 4. The sensor readout circuit of claim 1 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at 180° by the drive circuit.

1 5. The sensor readout circuit of claim 1 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at 270° by the drive circuit.

1           6.       The sensor readout circuit of claim 1 in which the fixed phase difference  
2   between the input signal and the output signal is maintained at a fixed phase difference  
3   between 0° and 360° by the drive circuit.

1           7.       The sensor readout circuit of claim 1 further including a phase delay  
2   adjustment circuit responsive to the input signal and the phase detection circuit for  
3   adjusting the phase difference between the input signal and the output signal.

1           8.       The sensor readout circuit of claim 1 in which the output signal is a  
2   sinusoidal voltage at a predetermined frequency.

1           9.       The sensor readout circuit of claim 8 in which the predetermined  
2   frequency is in the range of 10 MHz to 30 MHz.

1           10.      The sensor readout circuit of claim 8 further including a voltage step  
2   module configured to offset the input voltage by a predetermined amount to offset the  
3   frequency and measure the corresponding phase detector circuit output change.

1           11.      The sensor readout circuit of claim 10 in which input voltage is offset 90°.

1           12.      The sensor readout circuit of claim 10 in which input voltage is offset  
2   180°.

1            13.    The sensor readout circuit of claim 10 in which input voltage is offset  
2    270°.

1            14.    The circuit of claim 9 in which the Q is calculated from the ratio of the  
2    offset of the voltage and the offset of the frequency.

1            15.    The sensor readout circuit of claim 1 in which the sensor is a flexure plate  
2    wave device.

1            16.    The sensor readout circuit of claim 1 in which the sensor readout circuit  
2    continuously outputs a frequency representing the resonance frequency of the sensor.

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1           17.     A sensor readout circuit which provides a frequency signal output, the  
2 readout circuit comprising:  
3                   a phase detector circuit responsive to an output signal from a sensor and  
4 an input signal to the sensor and configured to detect the phase difference between the  
5 input signal and the output signal;  
6                   a drive circuit responsive to the phase detector circuit and configured to  
7 maintain a fixed phase difference between the input signal and the output signal; and  
8                   a phase delay adjustment circuit responsive to the input signal and  
9 the phase detection circuit for adjusting the phase difference.

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1           18.    A sensor readout circuit which provides a frequency signal output, the  
2 readout circuit comprising:  
3                   a phase detector circuit responsive to an output signal from a sensor and  
4 an input signal to the sensor and configured to detect the phase difference between the  
5 input signal and the output signal; and  
6                   a drive circuit responsive to the phase detector circuit and configured to  
7 maintain a fixed phase difference between the input signal and the output signal; and  
8                   a voltage step module configured to offset the voltage by a predetermined  
9 amount to offset the frequency and measure the corresponding phase detector circuit  
10 output change.

1           19.    The circuit of claim 18 in which the Q is calculated from the ratio of the  
2 offset of the voltage and the offset of the frequency.

- 1           20.     A sensor readout circuit which provides a frequency signal output, the
- 2 readout circuit comprising:
- 3                 a phase detector circuit responsive to an output signal from a sensor and
- 4 an input signal to the sensor and configured to detect the phase difference between the
- 5 input signal and the output signal;
- 6                 a drive circuit responsive to the phase detector circuit and configured to
- 7 maintain a fixed phase difference between the input signal and the output signal;
- 8                 a phase delay adjustment circuit responsive to the input signal and the
- 9 phase detection circuit for adjusting the phase difference; and
- 10                a voltage step module configured to offset the voltage by a predetermined
- 11 amount to offset the frequency and measure the corresponding phase detector circuit
- 12 output change.

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1           21.     A sensor readout circuit which provides a frequency signal output, the  
2 readout circuit comprising:  
3                 a phase detector circuit responsive to an output signal from a flexure plate  
4 wave device and an input signal to the flexure plate wave device and configured to detect  
5 the phase difference between the input signal and the output signal; and  
6                 a drive circuit responsive to the phase detector circuit and configured to  
7 maintain a fixed phase difference between the input signal and the output signal.

1           22.     The sensor readout circuit of claim 21 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at zero degrees by the drive  
3 circuit.

1           23.     The sensor readout circuit of claim 21 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at 90° by the drive circuit.

1           24.     The sensor readout circuit of claim 21 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at 180° by the drive circuit.

1           25.     The sensor readout circuit of claim 21 in which the fixed phase difference  
2 between the input signal and the output signal is maintained at 270° by the drive circuit.

1           26.     The sensor readout circuit of claim 21 in which the fixed phase difference  
2     between the input signal and the output signal is maintained at a fixed phase difference  
3     between 0° and 360° by the drive circuit.

1           27.     The sensor readout circuit of claim 21 further including a phase delay  
2     adjustment circuit responsive to the input signal and the phase detection circuit for  
3     adjusting the phase difference.

1           28.     The sensor readout circuit of claim 21 in which the output signal is a  
2     sinusoidal voltage at a predetermined frequency.

1           29.     The circuit of claim 24 further including a voltage step module configured  
2     to offset the voltage by a predetermined amount to offset the frequency and measure the  
3     corresponding phase detector circuit output change.

1           30.     The sensor readout circuit of claim 21 in which the sensor readout circuit  
2     continuously outputs a frequency representing the resonance frequency of the flexure  
3     plate wave device.



1           31.    A method for determining the frequency signal output of a sensor, the  
2    method comprising the steps of:  
3                detecting the phase difference between an output signal from a sensor and  
4    an input signal to a sensor; and  
5                maintaining a fixed phase difference between the input signal and the  
6    output signal.

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1           32.    A method for determining the frequency signal output of a sensor, the  
2 method comprising:  
3               detecting the phase difference between an output signal from a sensor and  
4 an input signal to a sensor;  
5               maintaining a fixed phase difference between the input signal and the  
6 output signal; and  
7               adjusting the phase difference between the input signal and the output  
8 signal to a predetermined fixed phase difference.

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